JAMSHID SOURATI

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ACADEMIC APPOINTMENTS

University of Chicago, Chicago IL — *November 2019 - Present*
Post-doctoral Scholar in the Department of Sociology, Knowledge Lab

Boston Children's Hospital, Harvard Medical School, Boston MA — *June 2017 - October 2019*
Post-doctoral Research Fellow in Radiology Department, Computational Radiology Laboratory

EDUCATION

Northeastern University, Boston MA — *January 2011 - December 2016*
Ph.D. in Electrical & Computer Engineering Department
• Received Dissertation Completion Fellowship (DCF) award for Fall 2016 from Northeastern University

Sharif Institute of Technology, Tehran, Iran — *September 2006 - September 2010*
B.Sc. in Electrical Engineering Department

RESEARCH INTEREST

Machine Learning, Active Learning, Statistical Learning, Data Science, Natural Language Processing, Graph Representation Learning, Knowledge Discovery Acceleration

RESEARCH EXPERIENCE

Artificial Intelligence (AI) to Accelerate and Punctuate Science — *Nov 2019 - Present*
University of Chicago

- *AI-based discovery acceleration:* Incorporated distribution of human experts into discovery prediction AI models, which boosted the precision up to four times (max. boost for COVID-19 therapies/vaccination)
- *Complementary AI:* Developing AI that intentionally avoids crowds of scientists to radically augment human discoveries by identifying scientifically promising hypotheses unlikely for scientists to imagine or pursue
- *Compositional discovery prediction:* synthetically inferring previously unseen compositions of scientific entities and predicting their associations with new combination of properties based on ML parsing of the current literature
- *Subjective uncertainty analysis:* Combining language models and machine learning to measure language uncertainty in scientific articles and contrasting it with the findings' objective uncertainty

Active Learning (AL) for Deep Models — *June 2017 - Sep 2019*
Boston Children's Hospital, Harvard Medical School

- Developed AL based on Fisher Information (FI) tailored to Fully Convolutional Neural Networks (FCNNs)
- Applied the FI-based AL to train FCNNs that segment brain area of MR images taken from pediatric patients.
- Achieved high segmentation accuracy with significantly smaller annotation cost in comparison to various types of uncertainty sampling (AL baseline).

Generic Active Learning (AL) Methods — *January 2012 - May 2017*
Northeastern University

- Built unsupervised AL algorithm that queries and incorporates pairwise constraints for spectral clustering
- Derived a novel theoretical relationship between Fisher Information (FI) and an asymptotic characteristic of supervised learning models—-also, designed a practical AL technique accordingly
- Developed AL approach based on mutual information (MI) with a submodular objective facilitating its optimization

SELECTED PUBLICATIONS

- P. Munjal, N. Hayat, M. Hayat, **J. Sourati** and S. Khan, "Towards Robust and Reproducible Active Learning using Neural Networks." IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 223-232, 2022.
- **J. Sourati**, A. Belikov, J. A. Evans, "Data on How Science is Made Can Make Better Science", Harvard Data Science Review, Issue 4.2, 2022.
- **J. Sourati**, J. A. Evans, "Accelerating Science with Human versus Alien Artificial Intelligences." arXiv preprint arXiv:2104.05188, 2021.

- **J. Sourati**, A. Gholipour, J. G. Dy, X. Tomas-Fernandez, S. Kurugol, S. K. Warfield, "Intelligent Labeling Based on Fisher Information for Medical Image Segmentation Using Deep Learning." IEEE Transactions on Medical Imaging (TMI), 2019.
- **J. Sourati**, M. Akcakaya, D. Erdogmus, T. K. Leen, J. G. Dy, "A Probabilistic Active Learning Algorithm based on Fisher Information Ratio." IEEE Transaction on Pattern Analysis and Machine Intelligence (TPAMI), vol. 40, no. 8, pp. 2023–2029, 2018.
- **J. Sourati**, A. Gholipour, J. G. Dy, S. Kurugol, S. K. Warfield, "Active Deep Learning with Fisher Information for Patch-wise Semantic Segmentation", Deep Learning in Medical Image Analysis and Multimodal Learning for Clinical Decision Support, pp. 83-91. Springer, 2018.
- **J. Sourati**, M. Akcakaya, T. K. Leen, D. Erdogmus, J. G. Dy, "Asymptotic Analysis of Active Learning Objectives based on Fisher Information." Journal of Machine Learning Research (JMLR), vol. 18, no. 34, 2017.
- **J. Sourati**, M. Akcakaya, J. G. Dy, T. K. Leen, D. Erdogmus, "Classification Active Learning Based on Mutual Information." Entropy, vol. 18, no. 2, 2016.
- **J. Sourati**, D. Erdogmus, J. G. Dy, D. H. Brooks, "Accelerated Learning-Based Interactive Image Segmentation Using Pairwise Constraints," IEEE Transactions on Image Processing (TIP), vol.23, no.7, pp.3057–3070, 2014.
- M. Moghadamfalahi, M. Akcakaya, H. Nezamfar, **J. Sourati**, D. Erdogmus, "An Active RBSE Framework to Generate Optimal Stimulus Sequences in a BCI for Spelling," IEEE Transactions on Signal Processing 2017.
- **J. Sourati**, S. C. Kazmierczak, M. Akcakaya, T. K. Leen, J. G. Dy, D. Erdogmus, "Assessing Subsets of Analytes in Context of Detecting Laboratory Errors." EMBC, 2016.
- **J. Sourati**, D. Erdogmus, M. Akcakaya, S. C. Kazmierczak, T. K. Leen, "A Novel Delta Check Method for Detecting Laboratory Errors," IEEE International Workshop on Machine Learning for Signal Processing (MLSP), Boston, 2015.
- M. Moghadamfalahi, **J. Sourati**, M. Akcakaya, H. Nezamfar, M. Haghighi, D. Erdogmus, "Active Learning for Efficient Querying from a Human Oracle with Noisy Response in a Language-Model Assisted Brain Computer Interface," IEEE International Workshop on Machine Learning for Signal Processing (MLSP), Boston, 2015.
- **J. Sourati**, D. H. Brooks, J. G. Dy, E. Ataer-Cansizoglu, D. Erdogmus, and M. Rajadhyaksha, "Unsupervised Wrinkle Detection in Reflectance Confocal Microscopy Images of the Human Skin." IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 705-708, 2012.
- **J. Sourati**, D. H. Brooks, J. G. Dy, and D. Erdogmus, "Constrained Spectral Clustering for Image Segmentation." IEEE International Workshop on Machine Learning for Signal Processing (MLSP), pp. 1-6, 2012.

PATENTS

- J. Evans, F. Shi, and **J. Sourati**, "Systems and methods for high-order modeling of predictive hypotheses." U.S. Patent Application 17/451,320, filed April 21, 2022.

COMMUNITY ACTIVITIES AND PRESENTATIONS

- **Reviewing** submissions in IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 2022.
- **Presenting** "Human and alien artificial intelligence in accelerating scientific discoveries", Minerva science of science retreat, 2021.
- **Reviewing** submissions in EPJ Data Science, 2021.
- **Reviewing** submissions in Conference on Neural Information Processing Systems (NeurIPS), 2019.
- **Program committee member** in International Conference on Machine Learning (ICML), 2018.
- **Reviewing** submissions in International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2018.
- **Reviewing** submissions in IEEE Transactions on Image Processing and Transactions on Medical Imaging.

SKILLS

Computer Languages	Python, R, MATLAB, *familiar with:* bash shell scripting
Tools and Libraries	TensorFlow, Pytorch, Transformer, Gensim, Scikit-learn, (Py)MySQL, CVXPY, GraphFrames, PySpark, Slurm (HPC), Git, Anaconda, Sphinx, LaTeX, PGF/TikZ